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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,044	06/24/2003	Gordon R. Woodcock	19441.0060	1043

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EXAMINER
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DOVE, TRACY MAE

ART UNIT	PAPER NUMBER
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1795

MAIL DATE	DELIVERY MODE
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12/20/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/604,044	<b>Applicant(s)</b> WOODCOCK ET AL.	
	<b>Examiner</b> Tracy Dove	<b>Art Unit</b> 1795	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 October 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 21-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 21-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

This Office Action is in response to the communication filed on 10/22/07. Applicant's arguments have been considered, but are not found persuasive. Claims 21-30 are pending.

#### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/22/07 has been entered.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 21-30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 21 and 28 recite "the ratio of the first molar flow rate to the second molar flow rate is equal to the ratio of the first electrochemical surface area to the second electrochemical surface area", which does not appear to be supported by the specification as filed. The specification contains Equation (1) at [0036], however, this is just a general equation regarding molar flow rate of a reactant and does not disclose anything about first and second

flow rate ratios and first and second electrochemical surface areas. Claim 28 further recites "the ratio of the third molar flow rate to the fourth molar flow rate is equal to the ratio of the third electrochemical surface area to the fourth electrochemical surface area", which is similarly rejected because the limitation does not appear to be supported by the specification as filed.

Claims 21-30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The claims recite at least one flow plate which has at least two flow field paths that have path lengths different from one another such that first and second electrochemical surface areas of the flow field plate have a current density equal to one another. However, the specification does not describe the values of the different lengths of the at least two flow field paths that result in first and second electrochemical surface areas of the flow field plate having a current density equal to one another. Paragraphs 0033-0034 are directed more towards a hypothesis than an actual inventive concept. The specification does not describe how to make or use the claimed invention. Regarding [0036], the specification does not enable how the dimensions of the flow path are selected so that the total resistance of the flow path enables a molar flow rate of reactant m represented by Equation (1). Claim 28 is likewise rejected for containing similar language.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 21-30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 21 and 28 recite "the ratio of the first molar flow rate to the second molar flow rate is equal to the ratio of the first electrochemical surface area to the second electrochemical surface area", which is indefinite. It is unclear how the molar flow rate of the reactant through the flow field and the electrochemical surface area serviced are related.

In claim 21 "said electrochemical surface areas" should be amended to recite "said first and second electrochemical surface areas" to provide proper antecedent basis.

Claim 22 should be amended to recite "each of said first and second flow field paths" in accordance with the amendment made to claim 21.

Claim 28 recites "the at least two electrochemical surface areas", which is confusing and unclear. The claim should be amended to recite first, second, third and/or fourth electrochemical surface areas.

In claims 29 and 30, it is unclear which "at least two flow field paths" are being further limited. The claims should be amended to recite first, second, third and/or fourth flow field paths.

To the extent the claims are understood in view of the 35 USC 112 rejection above, note the following prior art rejections.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 21-24, 26 and 28-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Cavalca et al., US 5,686,199.

Cavalca teaches a flow field plate for use in a proton exchange membrane fuel cell. The plate includes a network of flow passages (at least two flow field paths) for supplying the fuel or oxidant to the flow field and a network of flow passages for receiving the gases discharging from the flow field. Each flow sector includes a plurality of substantially parallel flow channels formed in the substantially planar plate surface, with each sector partitioned so as to subdivide the channels into a plurality of sets of channels disposed in serial flow relationship. The flow field configuration permits the reactant gases to be transported so as to supply the gases evenly to the entire active area of the corresponding fuel cell electrode with very low reactant gas pressure drop (abstract). The widths of the flow channels are selected so that the reactant gases flowing through each of the flow channels is permitted to diffuse outward through the porous backings of the corresponding electrodes in a manner which distributes the reactant gases to the entire active area of the anode and cathode of the fuel cell. The width and depth of the channels may be substantially constant along the length of each of the channels (7:1-53). Note the Figures. Thus the claims are anticipated.

\*

Claims 21-28 and 30 are rejected under 35 U.S.C. 102(e) as being anticipated by Boff et al., US 7,067,213.

Boff teaches flow field plate geometries wherein the flow field plate is used for a fuel cell. The plate comprises on at least one face an assembly of channels comprising one or more gas delivery channels and a plurality of gas diffusion channels connecting thereto (abstract). By forming sufficiently fine channels on the face of the flow field plates, the reactant gases are evenly distributed across the electrodes of the fuel cell (2:64-67). The narrow channels result in reduction in resistive electrical losses in the gas diffusion layer (4:10-14). The channels may be of varying width (4:31-34). The pattern of channels may have different widths and depths. Applying such a pattern of channels of varying width and depth has advantages such as ensuring uniform supply of reactant material to the electrodes and to ensure prompt removal of reacted products (5:6-16). Note the Figures. Thus the claims are anticipated.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 21-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Debe et al., US 6,780,536.

Debe teaches flow fields for uniform distribution of fluids or their active components or properties to and from a target area (2:32-36). The flow field may be embodied in a flow field device such as a flow field plate or bipolar plate used for distribution of reactants to, and removal

of products from, opposite sides of a catalyzed membrane in an electrochemical cell such as a fuel cell (1:10-15). The flow fields provide more uniform access of the fluid or its active component to the target area by providing highly uniform lateral flux through the fluid transport layer separating the flow field from the target area for the transported fluid (4:54-61). Uniform distribution of the fuel cell reactants (fuel and oxidant) over the catalyst electrodes in a fuel cell should result in more uniform utilization of the catalyst, resulting in better performance, stability and durability. Furthermore, the flow fields result in more uniform distribution of current density and waste heat generation. It is believed that the partial pressures of fuel and oxidant at the surface of the catalyst at any given point in an electrode of a fuel cell are directly related to the speed of the lateral flux of the gas in the DCC (5:50-65). The flow field includes significant land areas and may be composed of a single or multiple channels. The active area of the flow field may be any suitable size and shape and may be subdivided into separate zones serving separate portions of the target area. The flow field channels may have any suitable cross-section (6:32-57). Designs having non-parallel sequential channel segments may include a "zig-zag" serpentine design comprising at least one serpentine channel having non-parallel sequential major segments. The major segments may be curved, but are typically straight line segments. Turning segments may be made up of curved segments or one or more straight segments. Alternately the major segments may meet at a point (8:43-9:63).

Debe does not explicitly teach the at least two flow field paths have lengths different from one another. However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Debe teaches the active area may be subdivided into separate zones serving separate portions of the target area and treating



each portion as a single target area, served by a single channel or a channel composed of multiple courses. The active area can be any suitable size and shape (6:45-54). The channels may terminate at one end in a single or multiple opening inlet and at another end in a single or multiple opening outlet (6:55-67). Therefore, Debe at least suggests that the flow field paths may have lengths different from one another. Also, equation 2 of Debe shows the total pressure varied linearly along the flow channel so the pressure drop is proportional to the path length.

***Response to Arguments***

Applicant's arguments filed 10/22/07 have been fully considered but they are not persuasive. Applicant states the present specification teaches a fluid path with bends offers more resistance than a straight fluid flow path of the same total length. However, this concept was not novel at the time of invention by Applicant, but is considered common knowledge. Examiner believes the other asserted inventive concepts are taught by the cited prior art.

Applicant argues Cavalca teaches symmetric flow sectors having the same average path lengths. However, Cavalca teaches the average path lengths of the reactant gases through each of the flow sectors is substantially equal. The term "substantially equal" is broader than "equal". Furthermore, Cavalca is discussing "average" path lengths of each sector and not individual path lengths. Note the claimed invention does not require channels of different lengths, but requires flow paths of different lengths. Applicant further asserts Cavalca does not disclose the newly added limitation of the claimed invention. However, Applicant merely asserts as much without providing any support for the assertion. Note the added limitation has been rejected as new matter and lacking enablement in the specification.

Applicant argues Boff is devoid of any disclosure which would enable one of ordinary skill to determine relative lengths of the two flow field paths or molar flow rates relative to electrochemical areas serviced by the flow field paths or the reactant gases as they flow through. However, the claimed invention does not require any specific length or molar flow rate values. Furthermore, Examiner does not believe Applicant's invention is enabled. See rejection above.

Applicant argues Debe does not provide any motivation to modify the lengths. However, equation 2 of Debe shows the total pressure varied linearly along the flow channel so the pressure drop is proportional to the path length. Applicant argues the Office Action has failed to provide any apparent reason to modify Debe. This is incorrect. The rejection states Debe does not explicitly teach the at least two flow field paths have lengths different from one another. However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Debe teaches the active area may be subdivided into separate zones serving separate portions of the target area and treating each portion as a single target area, served by a single channel or a channel composed of multiple courses. The active area can be any suitable size and shape (6:45-54). The channels may terminate at one end in a single or multiple opening inlet and at another end in a single or multiple opening outlet (6:55-67). Therefore, Debe at least suggests that the flow field paths may have lengths different from one another. Also, equation 2 of Debe shows the total pressure varied linearly along the flow channel so the pressure drop is proportional to the path length. Applicant has not addressed the Examiner's motivation statement.


***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is 571-272-1285. The examiner can normally be reached on Monday-Thursday (9:00-7:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

December 17, 2007

  
**TRACY DOVE**  
**PRIMARY EXAMINER**